

Disaster Preparedness and Environmental Health

The Impact of Natural and Man- Made Disasters on Environmental Health

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Learning Objectives

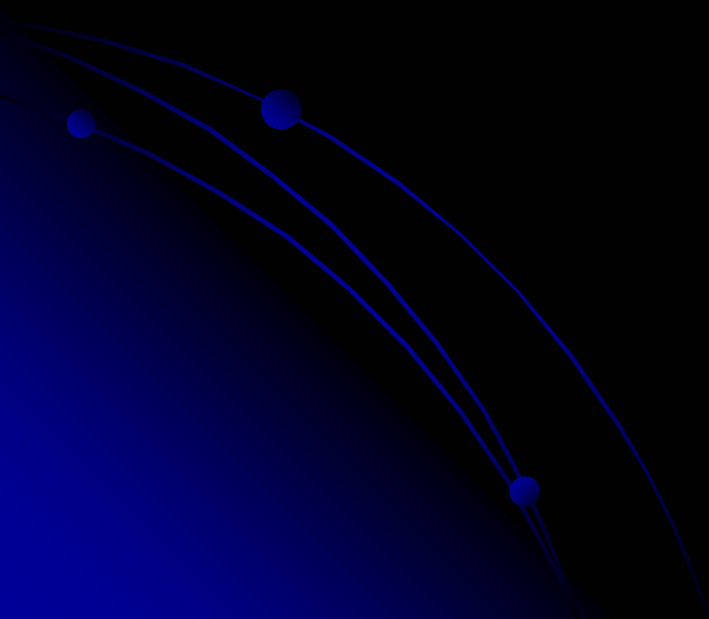
- To understand the impact of **natural and man-made disasters** on the environmental that adversely affect human health.
- To identify element in various events that allows comparable efforts for disaster preparedness.
- To appreciate the need for disaster preparation.

Disasters

Events that occur when significant numbers of people are exposed to **extreme events** to which they are **vulnerable**, with resulting **injury and loss of life**, often combined with damage to property and livelihood.

Environmental Health

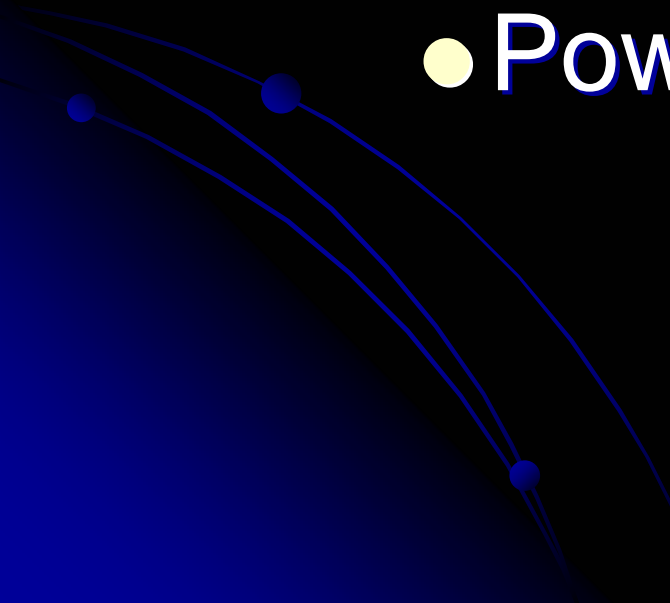
- Those aspects of human health and disease that are determined by factors in the environment .



Naturally Occurring EVENTS

- Disease Outbreak
- Earthquakes
- Extreme Heat (Heat Wave)
- Fire
- Floods
- Hurricanes
- Landslides & Debris Flow (Mudslides)
- Thunderstorms
- Tornadoes
- Tsunamis
- Volcanoes
- Wildland Fires
- Winter Storms and Extreme Cold

Man-Made EVENTS

- Terrorist Acts
 - Criminal Acts
 - Industrial Incidents
 - Power Outages
- 

Terrorism

As defined in the Code of Federal Regulations

The unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives

Terrorism is Typically Characterized by Origin of Terrorist


Domestic Terrorism (Without foreign-based direction)

- 1995 bombing of the Murrah Federal Building in Oklahoma City

International Terrorism (With foreign-based direction)

- 2001 bombing of the World Trade Center in New York

A Terrorist's Arsenal of Weapons

- Bombs and Bullets
 - Property Seizure and Hostage Taking
 - Weapons of Mass Destruction
 - Nuclear
 - Chemical
 - BIOLOGICAL
 - Cyber Technology
- 

Common Environmental Health Hazards

Terrorist Acts vs. Criminal & Incidental Events

- Bombs and Bullets
- Property Seizure and Hostage Taking

- Weapons of Mass Destruction

- Nuclear
- Chemical
- BIOLOGICAL

- Industrial Explosion, Violence in Workplace & Schools
- Hazardous Material Spill
 - Nuclear Material Exposure
 - Chemical Exposure
 - Microbial Contaminations

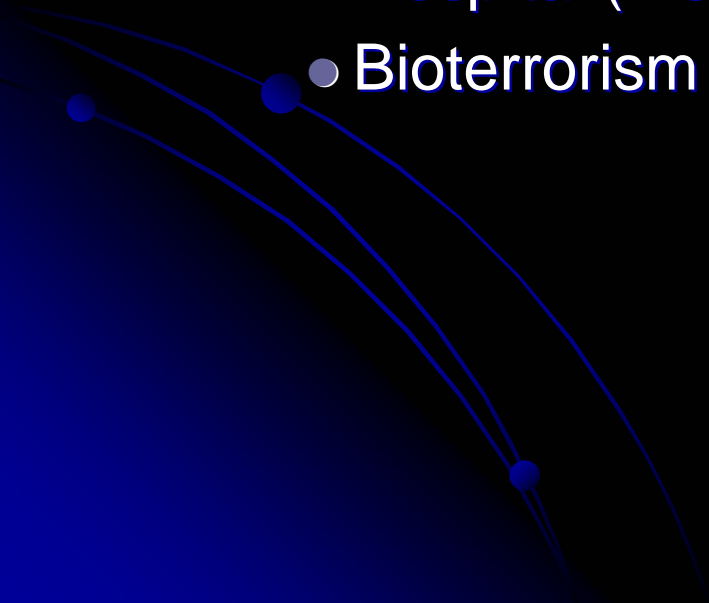
Biological Hazards

- Natural

- Disease Outbreak
- Loss of Sanitation Due to Other Disaster

- Man-Made

- Hospital (Institutional) Acquired Infections
- Bioterrorism



Disease Outbreak

Diseases Due to Microorganisms (Microbes)

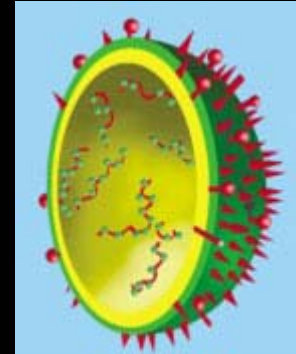
Microbes are tiny **organisms** - too tiny to see without a microscope, yet they are abundant on Earth. They live everywhere - in air, soil, rock, and water. Some of them live well in searing heat, and others in freezing cold. Like humans, some microbes need oxygen to live, but others cannot exist with it. These **microscopic** organisms are in plants, animals, and in the human body.

<http://www.niaid.nih.gov/publications/microbes.htm#a>

Microbes (germs, bugs)



Streptococci Bacteria



Influenza Virus

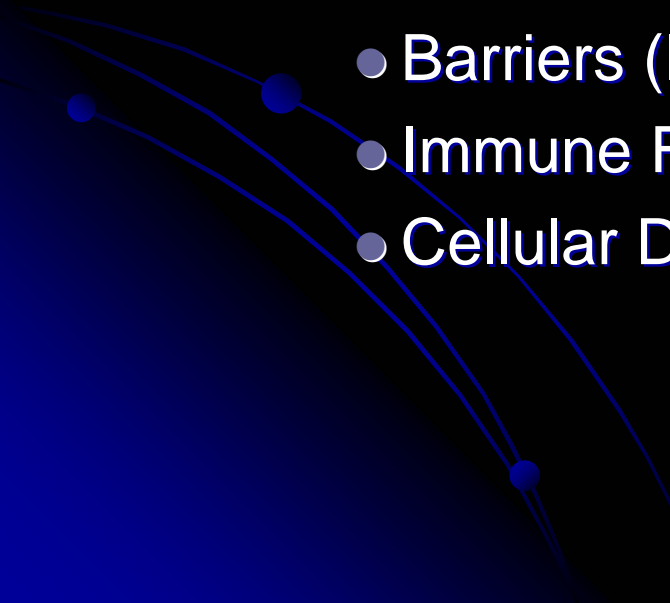


Penicillin Mold Fungus



Malaria Parasite

Factors Influencing Disease from Infections by Microbes

- Virulence of the Microbe
 - Critical Number of Microbes Present
 - Host Defense
 - Barriers (Intact Skin and Mucous Membranes)
 - Immune Function
 - Cellular Defense
- 



Infections due to Microbes Commonly Seen in the Mouth



Recent Disease Outbreak due to Microbes

- Flu
- West Nile Virus
- Severe Adult Respiratory Syndrome (SARS)
- Gastrointestinal Illness aboard Ships

(CDC's Vessel Sanitation Program (VSP))

Sources:

- <http://www.bt.cdc.gov/recentincidents.asp>
- <http://www.cdc.gov/nceh/vsp/surv/Gllist.htm>

Floods can potentially increase the transmission of the following communicable diseases:

- Water-borne diseases, such as typhoid fever, cholera, leptospirosis and hepatitis A
- Vector-borne diseases, such as malaria, dengue and dengue haemorrhagic fever, yellow fever, and West Nile Fever

Biological Weapons

Definition of Bioterrorism

The deliberate or threatened use of bacteria, viruses and toxins to cause disease, death or fear. Bioterrorism could also be directed against livestock, food crops, and environmental resources such as reservoirs.

<http://www.fema.gov/hazards/terrorism/>

Biological Agents

The Central Intelligence Agency reports that as least 10 countries are believed to possess or be conducting research on biological agents for weaponization

<http://www.fema.gov/hazards/terrorism/>



Biological Weapons

A large-scale bioterrorist attack is thought to be unlikely because the development and deployment of a weapon grade biologic agent that could infect massive number of people requires a high level of technical expertise

In Japan, a terrorist group has dispersed airborne formulations of anthrax and botulism throughout Tokyo on at least eight occasions but for unclear reasons, the attacks failed to produce illnesses

(JAMA. 1999; 281:1735-1745)

Biological Agents

(Bacteria, viruses, fungi or toxins)

CDC *Category A* – biological warfare agents that produce diseases of greatest concern due to likelihood of occurrence and severity of disease

- ***Botulism (Clostridium Botulinum)***
- ***Plague (Yersinia Pestis)***
- ***Smallpox (Variola Major)***
- ***Tularemia (Francisella Tularensis)***
- ***Viral Hemorrhagic Fever***
- ***Anthrax (Bacillus Antracis)***

Biological Agents

(Bacteria, viruses, fungi or toxins)

- Q Fever (Coxiella Burnetti)
- Brucellosis (Brucella Species)
- Glanders (Burkholderia Mallei)
- Ricin Toxin (From Ricinus Communis - Castor Bean)
- Epsilon Toxin of Clostridium Perfringens
- Staphylococcus Enterotoxin B

CDC Category B

CDC Public Health Emergency
Preparedness & Response

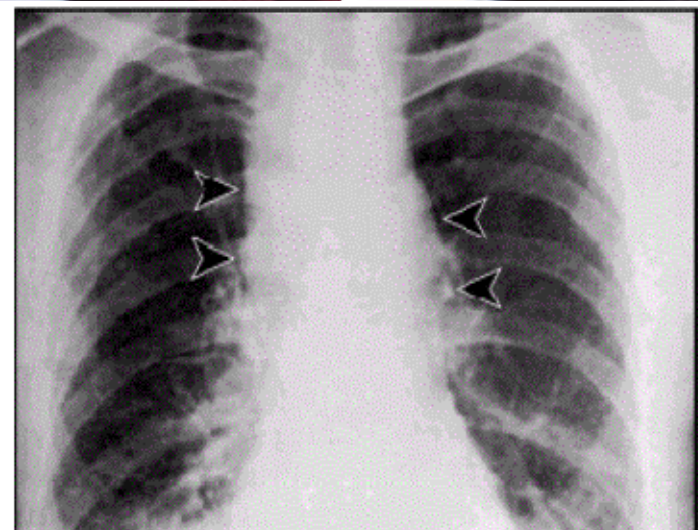
<http://www.bt.cdc.gov/Agent/Agentlist.asp>

Nipah Virus

- Hantaviruses
- Tickborne Hemorrhagic Fever Viruses
- Tickborne Encephalitis Viruses
- Yellow Fever
- Multidrug-resistant Tuberculosis

CDC Category C

Anthrax



Germ Warfare

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Smallpox



Disasters Due to Chemical Exposure

- Industrial

- Incidents
- Waste

- Chemical Warfare

- Manufacture
- Storage
- Deployment
- Disposal
- Use by Terrorist

Chemical Agents

Chemical agents have been used as weapons since World War I

They are compounds that cause damaging or lethal effects on humans, animals and even plants.

- The Department that as many as 26 nations may possess chemical agents and/or weapons and an additional 12 may be seeking to develop them

<http://www.fema.gov/hazards/terrorism/>



Chemical Agents

Chemical agents includes incendiaries, poison gases, herbicides and other types of chemical substances that can kill, maim or temporarily incapacitate.



Chemical agents

- Blister/Vesicants
- Blood
- Choking/Lung/Pulmonary/Damaging
- Incapacitating
- Nerve
- Riot Control/Tear
- Vomiting
- Other Industrial Chemicals



Mustard agents are usually classified as "blistering agents" owing to the similarity of the wounds caused by these substances resembling burns and blisters. However, since mustard agents also cause severe damage to the eyes, respiratory system and internal organs, they should preferably be described as "blistering and tissue-injuring agents". Normal mustard agent, bis-(2-chloroethyl)sulphide, reacts with a large number of molecules. The effect of mustard agent is delayed and the first symptoms do not occur until between 2-24 hours after exposure.

Weapons of Mass Destruction

Storage, transport and disposal

A critical environmental problem



Other Environmentally Sensitive Areas Susceptible to Accidents and Terrorist Acts

- Four (4) million tons of hazardous chemicals are shipped annually
- Approximately 10% of all trucks (Quarantell, 1981a) and 35% of all freight trains carry dangerous cargo (Kasperson, 1985).

Disasters Due to Radiation Exposure

Industrial

Manufacture
Storage
Industrial Accidents
Waste/Disposal

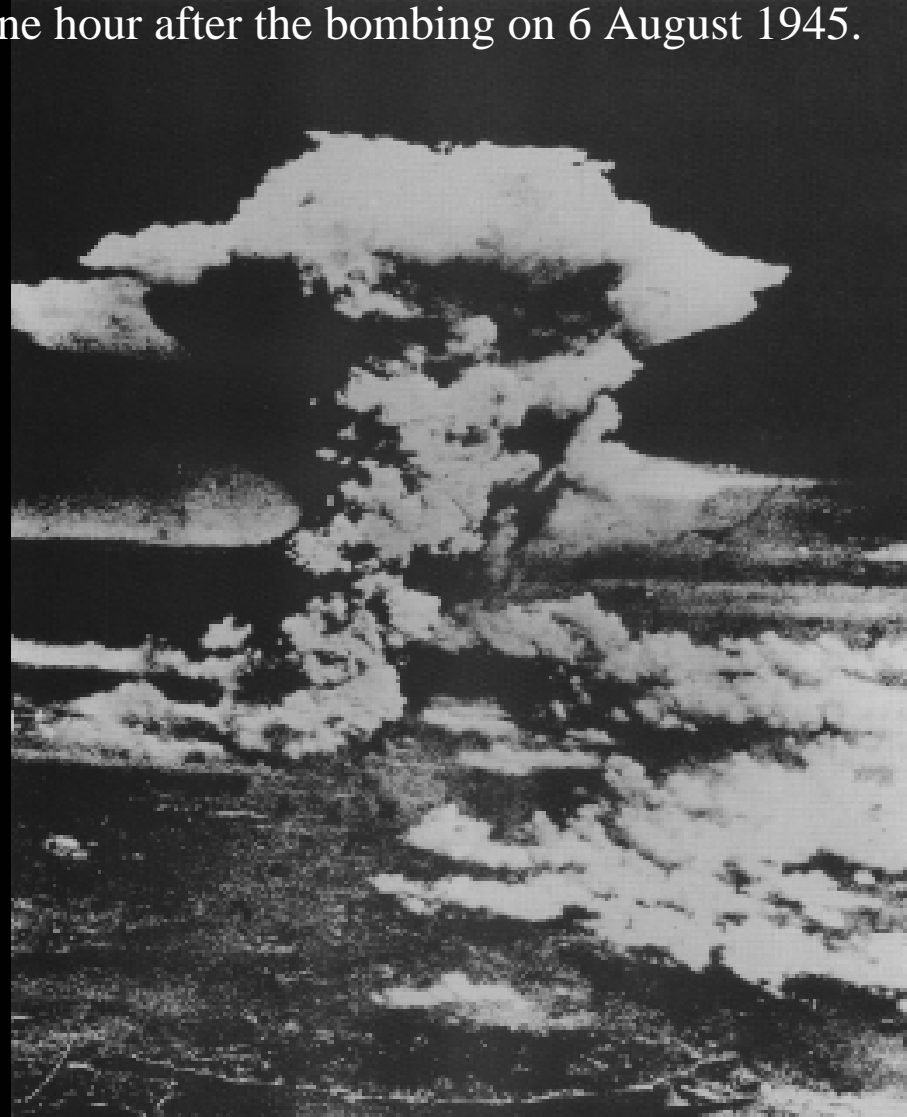
Nuclear Weapons

Manufacture
Storage
Deployment
Disposal
Use by Terrorist

Nuclear Weapons

About one hour after the bombing on 6 August 1945.

- Nuclear Bomb
- Dirty Bomb
- Nuclear Waste and Debris
 - Wartime Site Contaminants
 - Production
 - Transportation
 - Disposal of Waste



Weapons of Mass Destruction



*A real and present danger to the environment
in all phases of their existence*

- Research and development (especially testing)
- Wartime use
- Use by terrorist groups or rogue countries
- Storage, transport and disposal

Nuclear

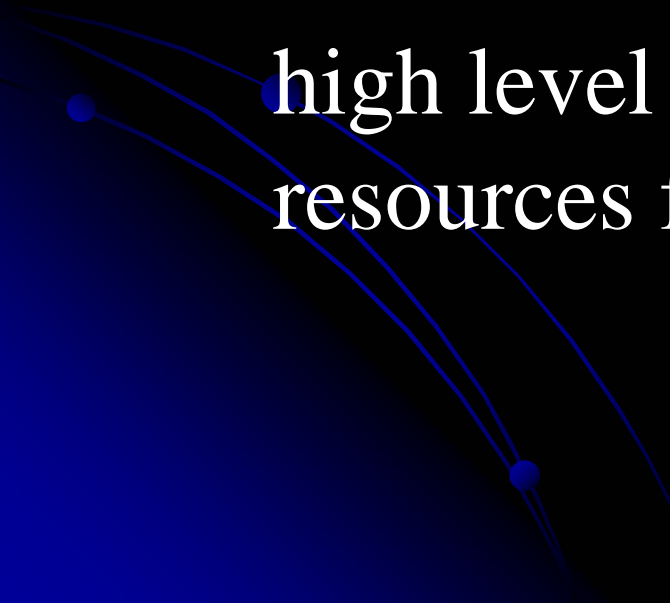
Chemical

Biological

Weapons of Mass Destruction

Weapons of Mass Destruction

Fortunately, the development and of a weapon grade chemical, nuclear or biologic agent that could injury or infect a massive number of people requires a high level of technical expertise and resources for development.



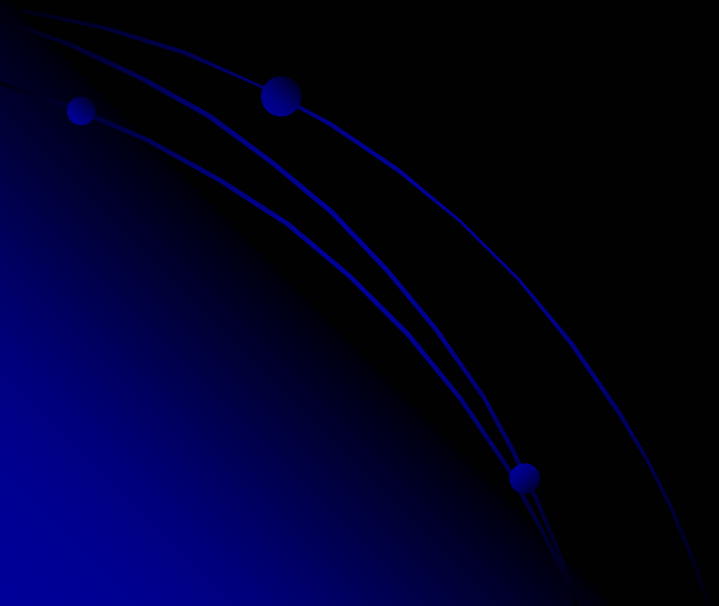
The Intended Impact of Terrorism

Typically, the intent is bring to the forefront of attention the terrorist's social/political agenda. This is accomplished by any means they feel necessary - the more dramatic and devastating, the better.

- Loss of human life and injuries
- Property damage
- Severe disruption of public services
(Electrical, water supply, public transportation and communications)

<http://www.fema.gov/hazards/terrorism/>

The tragic terrorist events of SEPTEMBER 11, 2001 and the subsequent sporadic episodes of anthrax exposure has forever changed the American Way of Life



Bombs and Bullets

- Bombings have been the most frequently used terrorist method in the United States
 - World Trade Center in New York (February 29, 1993)
 - United States Capitol Building in Washington, D.C.
 - Mobil Oil Corporation Headquarters in New York City

<http://www.fema.gov/hazards/terrorism/>

Bombs and Bullets

- Blast type Injuries (high-order/low-order explosives)
- Penetrating Injuries (explosive debris or shootings)
- Fall Injuries
- Hazmat concerns for exploding buildings, vehicles, projectiles, etc. (biological, chemical or radiation hazardous materials incorporated into the explosive device or in close proximity of the explosion)

Lead exposure for retained bullets

According to a Federal Bureau of Investigation bulletin issued November 15, 2002,

“In selecting its next targets, sources suggest Al Qaeda may favor attacks that meet several criteria:

- High Symbolic Value
- Mass Casualties
- Severe Damage to the American Economy
- Maximum Psychological Trauma”

Books, Journals, News Media. JAMA. 2003; 289:1571

Henderson et al editors. Bioterrorism: guidelines for medical and public health management. AMA Press, Chicago, Ill. 2002

Vulnerability of the Civilian Population

- Most terrorist incidents, especially those occurring in the United States, have been bombing attacks involving detonated and undetonated explosive devices, tear gas and pipe and fire bombs (*<http://www.fema.gov/hazards/terrorism/>*. Last accessed May 26, 2003)

- Typically, terrorists have been very innovative in creating tools to commit violent acts.

Creativity and the element of surprise was definitely seen in the September 11, 2001 attacks.

The synchronized use of four fuel-laden airplanes as bombs and incendiary devices to strategically target the financial, transportation, political and military seats of power effectively terrorized one of the wealthiest and most powerful nations in the world .

September 11, 2001

TERRORISM
STRIKES HOME

The World Trade Center
is highly symbolic in its
representation of western
economic dominance and
has been the site of
repeated acts of terrorism



The World Trade Center was the second largest building in the world and houses 100,000 workers and visitors each day



World Trade Center Bombing

September 11, 2001



Work continues 24 hours a day at the Trade Center site. It could take as long as a year to remove the 1.2 million tons of rubble from the collapsed tower.

World Trade Center Bombing

February 29, 1993

- Bomb loaded in vehicle in the parking garage
- Five (5) dead
- Thousands injured
- Bomb created crater 200 X 100 feet wide
crater five stories deep

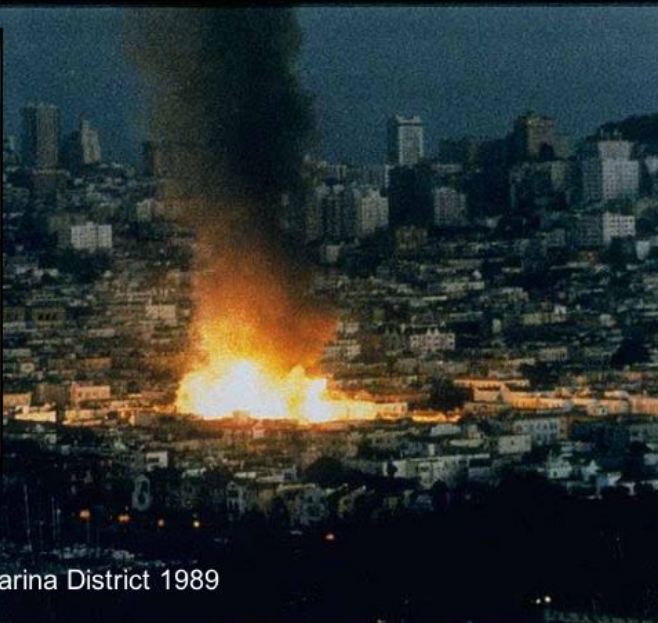
Although preparing for a wide range of disasters (terrorist threats, natural and incidental events) is a formidable challenge, the consequences of being unprepared could be devastating

Disaster Preparedness

Traumatic Injuries

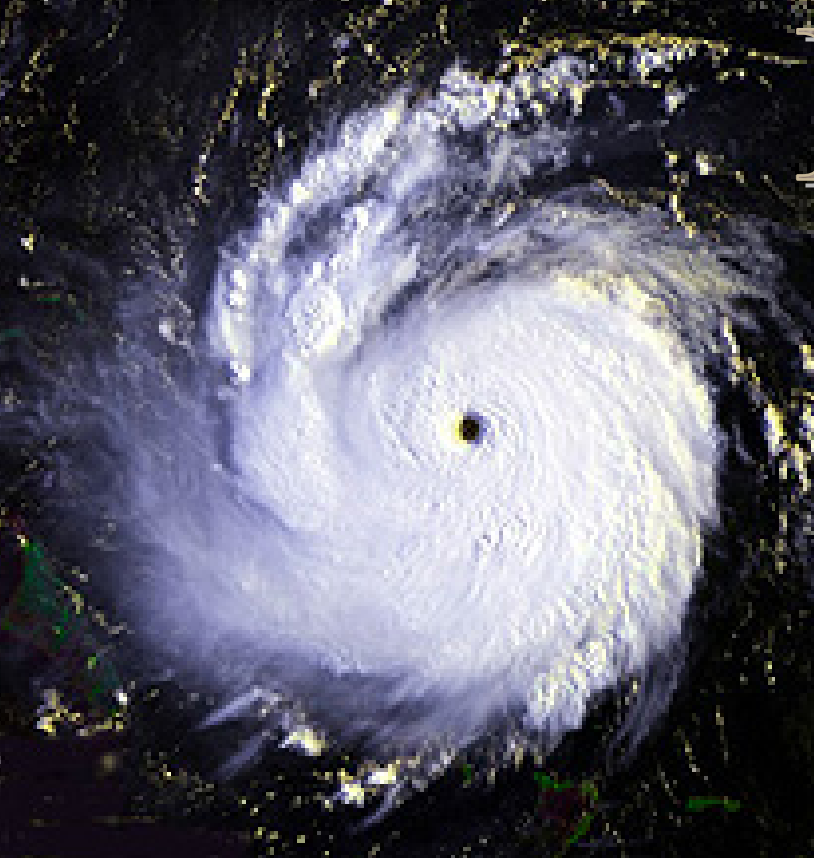
Several natural disasters simulate the Physical Injuries, Mass Casualties and Property Destruction that is seen with the Blast, Crush and Penetration-Type Injuries associated with terrorist acts

Earthquakes



Alaska 1964, SF Marina District 1989





Hurricanes



Tsunamis



Pictures: AFP/Australian Defense Force/Belinda Mephram
Banda Aceh, Indonesia

Pictures: AP/David Longstrech A Shattered Hotel, Khao Lak, Thailand

Wildfires







Volcanos



Water Damage Associated With



- Earthquakes
- Floods
- Hurricanes
- Thunderstorms
- Tornadoes
- Tsunamis



Looking for Loved Ones

Sean Sim (Singapore)
 Thai Mobile : 050-750-93
 沈德偉
 ↑
 SINGAPORE
 TOURIST
 NEED HELP

Weight / ตักรัด	45 Kgs	45 Kgs	55 Kgs
Short Gray hair, short black hair	Long light brown hair, short black hair	Long hair, short black hair	Long hair, short black hair
Blue Eyes, white skin	Green Blue Eyes, white skin	Blue Eyes, white skin	Blue Eyes, white skin
Red Hawaii shirt w/ white shorts	White, Red, light blue	Blue, white w/ long-sleeved shirt on back	White, white w/ long-sleeved shirt on back
Dark Green, white, white, white	White, white, white, white	White, white, white, white	White, white, white, white
Dark Green, white, white, white	White, white, white, white	White, white, white, white	White, white, white, white
Dark Brown, white, white, white	White, white, white, white	White, white, white, white	White, white, white, white
Phone call Mr. 06-971-4100	Phone call Mr. 06-971-4100	Phone call Mr. 06-971-4100	Phone call Mr. 06-971-4100
Phone Call, Mr. 06-971-4100	Phone Call, Mr. 06-971-4100	Phone Call, Mr. 06-971-4100	Phone Call, Mr. 06-971-4100
Mr. Loh, Mr. Noh, Mr. Philip, Mr. Noh at Thaksin Hosp. Surawong 877-285-745-5 Room 1014	Mr. Loh, Mr. Noh, Mr. Philip, Mr. Noh at Thaksin Hosp. Surawong 877-285-745-5 Room 1014	Mr. Loh, Mr. Noh, Mr. Philip, Mr. Noh at Thaksin Hosp. Surawong 877-285-745-5 Room 1014	Mr. Loh, Mr. Noh, Mr. Philip, Mr. Noh at Thaksin Hosp. Surawong 877-285-745-5 Room 1014

Pictures: AP/David Longstreath

Posters searching for missing loved ones hang at a community center in Takuapa, Thailand. The death toll in Thailand, according to authorities, is expected to rise above 3,000. Worldwide, more than 70,000 have been reported killed as of Dec. 30.

The Basics

Food

Shelter

Clothing



Pictures: AFP/Indranil Mukherjee |

Homeless Boys

Homeless Sri Lankan boys scramble for relief clothes being thrown from a truck at the Kilinochchi central college camp for homeless people in a Tamil Tiger-controlled area northeast of the Sri Lankan capital of Colombo. The government said nearly 25,000 people died in Sunday's tsunami strike, the worst tragedy to hit the island nation known for its palm-fringed beaches.

Timely Access to Medical Care and other public services



Pictures: AP/Sakchai Lalit |

A Survivor

Tsunami survivor Gunilla Lilljeqvist from Sweden arrives at Bangkok military airport from Phuket, Thailand on Dec. 29. Rescuers converged on beaches and islands to search for survivors of the devastation that destroyed idyllic resorts in southern Thailand.

Being Spared

Requires

Being Prepared

